A Mast-Raising System

By Robin Midgett, KB4IDC

Here's a description of an apparatus I built and used to raise my mast inside the tower top while installing antennas.

I developed it because I discourage the use of a bolt through the mast with or without a sleeve for backing up a thrust bearing. As was pointed out very quickly by an astute "TowerTalk" subscriber, the method suggested in "Hints & Kinks" (An Antenna Thrust Backup, *QST*, January 2002, page 67) weakens the mast near the most critical point in the system. The method of horizontal bolts biting into the vertical mast to support the weight of the antenna system (used by most thrust bearing manufacturers) does not appeal to me.

A much safer and easier solution is to use a commonly available shaft collar. Shaft collars are available in two basic configurations; as a solid ring with a single set screw or as a ring split in half with a pair of bolts that pull the ring halves together like a clamp. I chose the split version for my tower system, as this type does not mar the mast when tightened. In addition to transferring the weight of the antenna system to the tower without marring or weakening the mast, the shaft collar makes raising the mast incrementally easier by allowing the installer to tighten the shaft collar at any point along the mast.

My array has several VHF and UHF antennas at different heights on the mast, so being able to raise the mast a few feet at a time and have the mast safely held in place while installing the next antenna is a benefit. Shaft collars are available in various inside diameters, usually in 1/16-inch increments, and possibly in metric units as well. Industrial supply houses such as W.W. Grainger, MSC Direct and McMaster-Carr stock shaft collars in various metals such as cold rolled steel, aluminum and stainless steel. Prices for a 2-inch ID shaft collar are well under $20.

On the subject of raising the mast, I found that raising a 2-inch OD 18-foot 6-inch 4130 Chromoly mast to be a laborious task, especially at a tower top height of 130 feet. Adding antennas and feed lines only multiplies the difficulty due to weight and balance issues. My solution was to use a combination worm drive winch and a pulley and yoke assembly.

A view down the inside of the tower showing the mast, the pulley at the bottom of the mast, and the cable.

The collar and thrust bearing on the top of the tower.

The T-bar just below the thrust bearing.

The winch and the frame to which it's mounted.

Description

The worm drive winch is fastened to the tower top with U-bolts and a steel bracket that I built. The winch is threaded with a 50-foot length of flexible steel cable with a hook at its end. The pulley is an 8-inch steel cable pulley that I "liberated" from my employers trashcan. I built a steel yoke to support the pulley and attach the pulley to the mast. With the mast lowered inside the tower and hanging by the shaft-collar-thrust bearing combination, the yoke and pulley assembly is attached to the bottom of the mast. The cable from the winch mounted above is passed down the inside the tower through the pulley and back to the tower top on the opposite side of the tower from the winch where it is fastened—where it hooks to a tower rung.

The slack is taken up in the cable by the winch. At this point, the winch, cable and hook form a "V" in which the mast is cradled in a double purchase mechanical arrangement. The worm drive winch allows one person to raise and lower the mast easily with smooth operation and the mast doesn't give way to gravity when the winch is unattended. Don't forget to loosen and adjust the position of the shaft collar as the mast is raised or you will be wondering how to retrieve it later.

When all the antennas and feed lines are installed on the mast and the mast is raised to its final height, position the shaft collar appropriately on the mast. Meanwhile, the mast is held in place laterally by another bracket below the thrust bearing but above the rotator point while the rotator is installed. Once the rotator is installed, the bracket (T-bar as I call it) is removed and the rotator counteracts the lateral loads. While time is consumed on the setup and installation of the winch, it makes a two-person job easier for one person to perform. See the pictures of the system in operation.

I can supply drawings for fabricating the winch bracket, the pulley yoke and the T-bar. You can contact me at **robin.midgett@vanderbilt.edu**. NCJ